CHAPTER 3

Pollution Prevention Glossary

Many PFPR facilities use P2 practices that conserve water, reduce the amount of pollutants in wastewater, or eliminate wastewater generation altogether. This chapter presents alphabetic glossaries for two basic types of P2 techniques: (1) implementation of P2 practices; and (2) use of P2 equipment. For the P2 practices, a description of the practice and its benefits and an icon representing the practice are provided. For the P2 equipment, a picture or illustration and description of the equipment is provided. Throughout the manual, terms defined in this glossary will be shown in ***italicized bold*** print.

The techniques presented in this chapter have been identified through site visits to almost 60 PFPR facilities, where EPA observed the techniques in use. By implementing these P2 techniques (e.g., use of ***flow reduction equipment***), many PFPR facilities generate less wastewater volume. By controlling the volume of wastewater generated, facilities can often reuse a larger overall percentage of their wastewater. Additionally, facilities can achieve optimal P2 benefits by combining P2 techniques (e.g., use of ***flow reduction equipment***, ***dedication of equipment***, and ***interior storage and reuse***) to reduce or eliminate wastewater generation and to increase the level of reuse and recycle. **[Note: This P2 glossary presents not only those practices listed in Table 8 of the final PFPR rule, but also other P2 techniques that were observed in the industry.]**

P2 Practices

These practices reduce the amount of active ingredients and other raw materials lost in wastewater discharges, and may also decrease the volume of PFPR process wastewater generated.

Pollution Prevention Practices

Dedication of Equipment

PFPR facilities use production lines to formulate, package, and repackage a wide range of products. When switching a production line from one product to another (i.e., product changeover), the facility cleans the equipment (typically with water) to prevent cross-contamination of products. Dedicating equipment on formulating and/or packaging lines to the production of one product or product type can reduce or eliminate the need to clean that piece of equipment for product changeover. In addition, because of the elimination of cross-contamination concerns, routine cleaning typically uses less water.

Some facilities dedicate just their formulation tanks, thereby eliminating one of the most highly concentrated wastewater streams generated at their facility. Other facilities have dedicated storage tanks or entire formulating, packaging, or repackaging lines, if they produce large quantities of that product over long periods of time. Still other facilities dedicate transfer hoses, pumps, and other miscellaneous equipment. These PFPR facilities have implemented this practice by using equipment that is:

- **Dedicated to one product**—a piece of equipment, or an entire formulating or packaging line, that is used to produce only one specific product. This type of dedication eliminates product changeover cleaning, and significantly reduces routine cleaning. In addition, most cleaning rinsates can be reused directly into the process (see ***Interior Rinsate Storage and Reuse***).
- **Dedicated to a product family**—a piece of equipment, or an entire formulating or packaging line, that is used to make products that have common ingredients (such as s-triazine pesticides) or similar uses (such as herbicides used on corn crops). This type of dedication can significantly reduce product changeover cleaning and routine cleaning. In addition, most cleaning rinsates can be reused directly into the process (see ***Interior Rinsate Storage and Reuse***).
- **Dedicated to solvent-based versus water-based products**—a piece of equipment, or an entire formulating or packaging line, that is used for products that have a common base solvent (e.g., water, isopropyl alcohol). This type of dedication eliminates water-contaminated solvent rinses and solvent-contaminated water rinses that are generated during product changeover from water-based to solvent-based products and solvent-based to water-based products. Dedicating equipment to a common base can eliminate solvent-water rinsates, which typically cannot be reused, and can significantly reduce product changeover cleaning and routine cleaning. In addition, most cleaning rinsates from common-base-dedicated equipment can be reused directly into the process for future formulation of the same or compatible product (see ***Interior Rinsate Storage and Reuse***).

Direct Reuse of Drum Rinsate

PFPR facilities frequently receive raw materials in drums, such as 55-gallon steel or 30-gallon fiber drums. Empty drums may be returned to the supplier, or the facility may by responsible for disposal. To prepare the drums for reuse, facilities "triple rinse" the drum (i.e., rinse out the inside of the drum with water three times) or pressure rinse the drum according to procedures provided in 40 CFR, Part 165. A "triple rinse" is defined in Part 165 as flushing the container three times, using a volume of the diluent equal to approximately 10% of the container's capacity. When preparing drums for disposal that contained nonhazardous materials, facilities should consult 40 CFR, Part 165.9 to determine if a triple rinse is required.

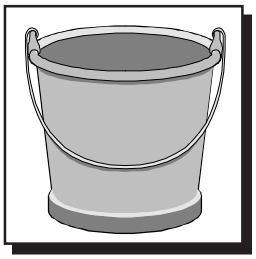
If the drum contained a material that is a listed hazardous waste, facilities must also follow procedures provided in 40 CFR, Part 261.7(b) to empty the container and dispose of or recycle it as nonhazardous. For example, "U" listed wastes (40 CFR, Part 261.33(f)) must be removed so that no more than 2.5 centimeters (or one inch) of residue remains on the bottom of the con-

tainer, no more than 3% by weight of the container capacity remains in containers less than or equal to 110 gallons, and no more than 0.3% by weight of the container capacity remains in containers larger than 110 gallons. It may not be necessary to rinse the container if the material can be sufficiently removed by draining, pouring, pumping, or aspirating, unless rinsing is required by 40 CFR, Part 165. Other wastes, such as "P" listed wastes (40 CFR, Part 261.33(e)), must be removed by triple rinsing the container using a solvent capable of removing the material.

The simplest, most cost-effective method of handling the subsequent rinsate is to reuse it directly in the product formulation at the time of formulation. This method eliminates the water from the facility's waste stream and recovers the remaining raw material in the drum without the costs and space needed for storage of the rinsate. If the product is a solvent-based product, the drums can be rinsed with the base solvent of the product instead of water to prevent creating a rinsate that cannot be added directly to the formulation.

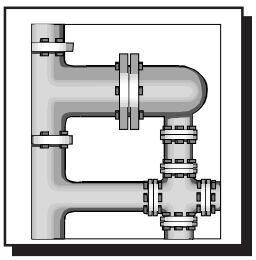
In addition to reusing rinsate, some PFPR facilities use ***flow reduction equipment***, such as high-pressure washers, to effectively clean drums, while minimizing the amount of rinsate generated (generally 5 to 15 gallons of rinsate per drum).

Formulating and Packaging Small Batches in Containers



Facilities that generate small quantities of product may formulate that product directly in the final shipping container (e.g., 55-gallon drum or minibulk tank) to eliminate the use of a separate formulation tank. Facilities may also package products directly from the formulation tank or blender into the final shipping container to eliminate using interim storage tanks, packaging tanks, and transfer hoses. These practices eliminate the need to use and clean certain formulating and packaging equipment, thereby reducing the amount of rinsates generated during cleaning.

Good Housekeeping Practices



Good housekeeping practices are simple, straightforward operating practices that can significantly reduce wastes. These practices include performing preventive maintenance on all valves, fittings, and pumps; placing drip pans under valves and fittings where hoses or lines are routinely connected and disconnected; and cleaning up spills and leaks in outdoor bulk storage and process areas to prevent contamination of stormwater or exterior rinsewaters. Other good housekeeping practices include repairing leaky valves and fittings in a timely manner and reusing the material collected in drip pans.

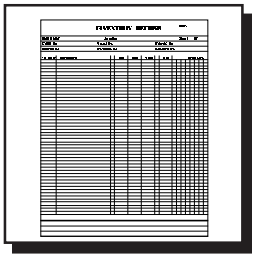
Interior Rinsate Storage and Reuse

PFPR facilities use production lines to formulate, package, or repackage a wide range of products. When switching a production line from one product to another, the facility cleans the equipment (typically with water) to ensure product quality. This interior equipment rinsate (either water or base solvent) can be collected and stored in 55-gallon drums or small tanks for reuse as make-up water in the next batch of that formulation or a compatible formulation (e.g., product with same ingredients but at varying concentrations). In

some cases, the rinsate can be reused immediately in the product if additional water or solvent is needed for the final product (e.g., refilling establishments preparing the product for application on fields).

When facilities combine this practice with the use of ***flow reduction equipment, dedication of equipment,*** and other production practices, they can minimize the volume of rinsates generated during production of pesticide products and are often able to reuse all interior equipment cleaning rinsates. Benefits from these practices include reduced costs for raw materials and waste disposal or treatment.

Inventory Management

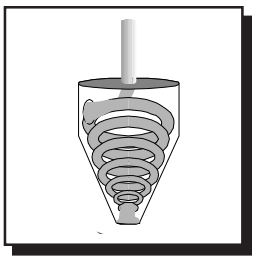


Many PFPR facilities operate inventory management systems to track raw materials, finished products, and waste products. These systems are also useful for tracking cleaning rinsates that can be reused at a later date in product formulations. Some facilities log these rinsates into their inventory as raw materials to ensure reuse as soon as possible and to eliminate the possibility of forgetting about them once they are stored. In addition, quick reuse can reduce shelf-life expiration problems. These inventory systems may be manual (for smaller operations) or computerized (for larger operations), and may also contain other environmental data, such as waste disposal information.

Non-Water Interior Equipment Cleaning

PFPR facilities can use several cleaning techniques in addition to ***dry process cleaning equipment*** to reduce or eliminate wastewater generation. After formulating or packaging, dry carriers used in the final product (e.g., clay) are often used to initially clean the equipment. These materials are run through the equipment to absorb residual product that may be present and stored for use in a future batch of that product. A production line may also be "blown" clean by forcing air through the equipment and collecting the material that exits the system for reuse. Hoses and transfer piping may be cleaned in this manner. A water rinse may follow this procedure. Cleaning a line with dry materials increases recovery of raw materials and reduces the amount of water used during cleaning operations.

Operation of Air Pollution Control Devices



Air pollution control devices, including baghouses, cyclones, filters, and wet scrubbers, are sometimes installed on formulating or packaging lines to control the release of volatile or dust emissions.

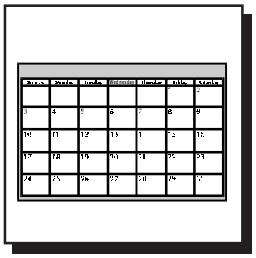
- *"Dry" Devices*—Baghouses, filters, or cyclones reduce air pollution without the use of water by collecting dust and other particles generated during production, particularly on dry product lines. Some facilities are able to reuse the solid materials collected from those devices in the pesticide production process.
- *"Wet" Devices*—Wet scrubbers also reduce air pollution by simultaneously removing soluble and wettable particulates and soluble gases from an air stream. To minimize wastewater generation from wet scrubbers, facilities can either operate them with continuously recycled water until replacement of the contaminated water is necessary, or with a bleed stream

(blowdown) on a continuous basis. However, facilities should not reduce their flow to the point where it hinders their ability to meet Clean Air Act or other requirements. In some cases, if a wet scrubber is dedicated to a line that formulates a water-based product, the blowdown from the scrubber can be reused in that formulation.

Operation of Department of Transportation (DOT) Test Baths

DOT test baths are used to test aerosol cans for leaks or weaknesses under pressure. The cans are visually examined for leaks while in the test bath. Because drips on the outside of cans, or occasionally exploding cans, can contaminate the water bath, the water in batch baths must be changed periodically to ensure visibility and to reduce the presence of residues that may adhere to cans leaving the bath. Facilities operating DOT test baths with continuous overflow can recirculate the water for reuse. If necessary for visual clarity, PFPR facilities can recirculate the water through a filter (e.g., diatomaceous earth or activated carbon) to remove dirt and oils. The use of filters allows water to be recirculated for longer periods of time before changeout is necessary.

Production Scheduling



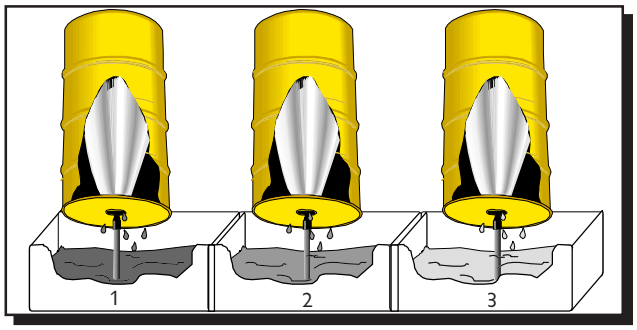
If a facility is not able to practice ***dedication of equipment***, they often can manage their production schedules to minimize product changeover cleaning operations. To do so, facility personnel can develop cleaning procedures specific to each potential changeover. They can examine which products can be formulated in succession without the need for cleaning (e.g., they contain the same ingredients but in varying concentrations) or with a minimal cleaning. On any given day, production can be scheduled to minimize the cleaning efforts and therefore the wastes that are generated during cleaning. In some cases, facilities are able to schedule production so that the cleaning rinsates generated are able to be reused in subsequent processes.

Training and Written Standard Operating Procedures

Employee training and well-written standard operating procedures (SOPs) are an integral part of any pollution prevention program. Training will ensure that all employees are aware of the goals of current pollution prevention initiatives and how the initiatives will improve operations. Written SOPs will reinforce operator training and ensure that all functions are performed efficiently. It is important to obtain both management and employee buy-in to the program, and to view pollution prevention as a way of doing business. Some PFPR facilities have formed pollution prevention teams or coordinators to develop SOPs for cleaning procedures and for reuse of cleaning rinsates into formulations. Some facilities have also integrated an evaluation of an employee's adoption of P2 practices into performance reviews or provided awards or incentives for innovative P2 ideas.

Pollution Prevention Equipment

Drum Rinsing Station



A drum rinsing station consists of a series of three cells that are used to triple rinse drums. A typical station uses a spray nozzle to shoot water at high pressure into a drum that is inverted over the cell. The rinsate flows out of the drum into the cell, the drum is moved to the next cell, and the process is repeated. The first cell is used for the first rinse, which results in the most removal of pollutants and the most contaminated rinsewater. The second cell is used for the second rinse, which removes additional pollutants, but the rinsewater is not as contaminated as the first cell. The third cell is used for the final rinse, at which point most of the pollutants have been removed by prior rinses and the rinsewater is the least polluted of the three cells.

By rinsing the drum in stages (i.e., cells), the volume of rinsewater is reduced. The rinse water in the first cell is reused until it is visibly too contaminated to be used further. At that time, it is removed from the cell and treated or disposed of. The cleaner rinsewater from the second cell is transferred into the first cell and the cleanest rinsewater from the third cell is moved to the second cell. Fresh water is added only to the third cell. As a result, two cells of water are recycled, only one cell is filled with new water, and the quantity of water used is reduced by about two thirds. Some PFPR facilities using a drum rinsing station with 100-gallon water cells have cleaned as many as 70 drums before changing water.

Dry Process Cleaning Equipment

Dry process formulating and packaging lines, which do not generate wastewater, are often cleaned using equipment such as brushes, scrapers, and vacuums. This cleaning equipment will physically remove solids that have adhered to process equipment during the formulating or packaging step. Examples of dry process cleaning equipment include the following:

- *Brushes/Scrapers*—Wire brushes and scrapers are used to remove packed or dried materials from the equipment that would not be removed with vacuuming alone. This material can then be vacuumed or swept up for reuse.

- *Vacuums*—A standard industrial shop vacuum (with appropriate electrical classification and exhaust filtration) can be used to collect solids and dusts that have settled on dry formulating and packaging equipment during processing. It can also be used to clean floors in the dry process area and to collect spilled product. The collected material can often be reused in the formulating process.

Cleaning the equipment with brushes, scrapers, or vacuums may result in recovery of dry product that can be reused in the process, and significantly reduce or eliminate the need for water washes and the subsequent water

rinsates that cannot be directly reused. For example, a facility may initially scrape off dried material from the process line equipment, vacuum loosened materials, and finally perform a quick water rinse. The rinsate will contain significantly less contaminants than if the facility had relied upon only water to clean the equipment.

Floor Scrubbers

Floor scrubbers are mechanical devices that continually recirculate cleaning water to clean flat, smooth surfaces with circulating brushes. They come in a variety of shapes and sizes. During operation, the scrubber collects the cleaning water in a collection tank, which is easily emptied after the cleaning process, or at a later date.

Cleaning floors by other methods, such as a mop and bucket or garden hose, requires larger amounts of water. Floor scrubbers will significantly reduce the amount of water used for floor cleaning while increasing the effectiveness of the cleaning operation. A typical floor scrubber can clean large processing areas in one hour but use only 10 to 20 gallons of water. The use of floor scrubbers also reduces labor costs and water costs.

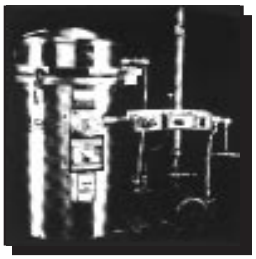
Flow Reduction Equipment

Flow reduction equipment includes simple mechanical devices that control how water is sprayed during cleaning operations. The use of flow reduction equipment reduces the volume of water generated during cleaning operations, as well as increases efficiency in the cleaning process. Examples of flow reduction equipment are:

- *Spray Nozzles*—Nozzles are the most common form of flow reduction equipment used in the PFPR industry. Spray nozzles are used to regulate the amount of water used to clean both the interior and exterior of process equipment. They also direct the water at a higher pressure than from an unequipped hose, resulting in a more effective cleaning stream.
- *High-pressure, low-volume washers*—These washers provide a higher degree of cleaning than a spray nozzle. Typical pressures range from 500 to 3,000 pounds per square inch (psi).
- *Spray balls*—These balls direct water through multiple nozzles or drilled holes to efficiently clean the inner surfaces of closed or open tanks or trucks. Typical water pressures range from 45 to 75 psi; flow rates range from 10 to 48 gallons per minute (gpm), depending on the size of the spray ball and the size of the tank to be cleaned.
- *Hot water/steam cleaners*—These cleaners are similar to high-pressure, low-volume washers except they use steam or hot water. They are useful for hard-to-clean products, such as emulsified formulations or highly viscous materials. Typical operating pressures range from 230 to 3,000 psi; flow rates range from 1 to 6 gpm.

Without the use of this equipment, facilities may generate more wastewater, particularly interior equipment rinsates, during the cleaning process than can possibly be reused in product formulation. Other benefits to the use of flow reduction equipment include lower water costs, increased cleanliness, and reduced storage, treatment, or disposal costs. In addition, use of flow reduction equipment aids in avoiding free flow of water from unattended hoses.

Solvent Recovery Equipment



Solvent recovery equipment primarily consists of flash distillation units, which use the difference in boiling points to physically separate organic solvent from wastewaters. Some facilities may generate solvent-contaminated wastewaters during cleaning operations that are unable to be reused in water-based products; other facilities generate water-contaminated solvent wastes that are unable to be reused in solvent-based products. These wastes are fed through the distillation unit at a temperature where the solvent is vaporized from the waste stream. The solvent vapor is then condensed to liquid. These efficient units recover high yields of spent solvent for reuse in later formulations.

The use of solvent recovery equipment can reduce raw material (i.e., solvent) usage and cost. In addition, this equipment can reduce disposal costs by recovering solvent for reuse and reducing the quantity of solvent-aqueous changeover water that is disposed of as waste.